Examiners' Report

Principal Examiner Feedback

Summer 2018

Pearson Edexcel International GCSE
In Mathematics A (4MA1) Paper 1HR

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Students who were well prepared for this paper were able to make a good attempt at all questions. It was encouraging to see some good attempts at topics new to this specification. Of these new questions, students were particularly successful on Pressure and had a good idea about Arithmetic sequences.

On the whole, working was shown and easy to follow through. There were some instances where students failed to read the question properly. For example, in question 2 a significant number found the largest or smallest share rather than the difference between these.

The intersecting chord theorem is a weakness and work on surds must show full method as requested in the questions.

1 (a) This question was done well with many correct answers. A small number were unable to move letters around without sign errors and a few thought that swapping M and a round was sufficient. A number wrote the answer without $a =$ but in the majority of cases the $a =$ could be seen in the working so no marks were lost, but students should understand that they do need to give the subject = in a change the subject question.
(b) Many students were able to correctly solve the inequality but far too many thought the answer was $x = 8.6$ or just 8.6. These students were unable to gain the final accuracy mark even if we saw the correct solution in the working. It is essential that students realise that for inequalities there is not a single value solution. A number of students decided to reverse the inequality when dividing by 5 or got the basic skill of adding 4 incorrect.
(c) We saw a good number of correctly fully factorised expressions and a reasonable number who were able to take out at least 2 terms and partially factorise correctly, gaining M1. Students must look carefully to ensure they have fully factorised any expressions. There were a few candidates who thought that factorising this expression needed two brackets.

2 This ratio question was done well by many students, but far too many did not read the question carefully enough and gave the largest share or the smallest share and not the difference between these. A common error where no marks were awarded was to divide the 3450 yen by 2 and then by 6 and then by 7 rather than (2 + 6 + 7). One key to this question was to show working because anyone who showed the sum of 2 + 6 + 7 = 14, for example, but continued with a correct method was able to gain 3 of the 4 marks.

3 This question was generally well solved and if full marks were not gained a student usually benefitted from at least M2 for finding Gopal's new monthly pay. A few stopped at the stage 1.125 or 112.5% and lost the final accuracy mark. A small number of students worked out 80% (by using multiplier 1.8), instead of 8% (using 1.08). It was

also surprising how many students attempted to find percentages using a non-calculator method or even trial and error for the last part.
Some students gave an answer of 12% by using original £20000 from which to base their % i.e. £200 = 1%, so the pay rise of £2400 was equivalent to 12% in their eyes. They had not related it to Jamuna's original amount.

4 Students are getting used to the 'show that' fraction question and on the whole were very good at showing us how to arrive at the given answer. It is essential that students show us every stage in their working so that they can benefit from full marks. Those who did not gain full marks, often gained M1 for correct improper fractions to start with. The few decimal solutions gained no marks at all.

5 We saw the correct angle of 72° from correct working appearing many times. The reasons, however, escaped many students and when asked for this they should not ignore it as appeared to be the case for many. Some of those who did give a reason for the right-angle, referred to 'tangent' and 'circle' or 'centre of circle', but not 'radius'(or diameter). A number of students got confused with other circle theorems and thought angle *POQ* would be 36° (angle at centre is twice angle at the circumference).

6 (a) Nearly all students were able to correctly work out the curved surface area of the cylinder. A small number gave us the total surface area or the curved surface plus a circle and a few used the formula for area of a circle multiplied by 1.6. It was surprising to see 3.14 being used as pi with the use of modern scientific calculators on hand.
(b) This question involved working with the ratio of the sides and many students used $1.6 \div 0.6$ and rounded this to 2.6, and continued by using this rounded value rather than the correct value. We allowed method marks, but the lack of accuracy meant the A mark was not awarded. Students should try to work with the answer in their calculator rather than a rounded figure; this applies throughout the paper but was very evident here.

7 (a) This was a very straightforward question for many, but there were still some who gave the answer 70.2 as they thought the mean for both classes would be the mean of the 2 values for the mean of class A + class B, ie $(75 + x) \div 2 = 72.6$
(b) We saw many correct answers for the range of scores for all the students in both classes. However, there were several who once they had found the highest score for class A and the highest score for class B did not know what to do and found the average of these as well as many other interesting calculations.

8 This was quite a straightforward question and well answered by many students taking this paper who benefitted from full marks for use of sine or cosine. A small number thought they needed to find the side opposite the angle of 52° but for the award of the first method mark we also needed to see this side in a Pythagoras calculation in order to be

sure they were finding the side marked x. Maybe these students were not familiar with x not on the top of their fraction for cos 52° or sin38°. Clearly this was a long way round to find x and students should be shown how to look for the most direct calculation.

9 At the Higher level, many students were able to show a fully correct method and correct answers to benefit from full marks for this simultaneous equations question. Some were caught out when subtracting a negative number, and we frequently saw $2y = 102$ from $(7x + 7y = 105) – (7x – 5y = 3)$.
There are a number of who continue to believe that they always need to subtract to eliminate the variable, leading to incorrect methods when trying to eliminate the y term. Some subtracted when they should have added. Those who gave us correct answers with no working gained no marks – and students must be reminded that when a question says ‘show clear algebraic working’ answers without this are unlikely to score marks

10 (a) This question was targeting the assessment objective on indices and without seeing this work we were unable to award marks. Therefore answer such as $\frac{1}{16}$ or 0.0625 without any indices work scored zero. The key to answering the question was to realise that $8 = 2^3$ and then that dividing powers of 2 meant you needed to subtract the indices. Many students were able to gain the 2 marks but there were several who gained only 1 or even zero marks. Too many students relied solely on the use of their calculators and didn’t know how to use the answer given on the screen.
(b) This part was done better than part (a) and it seemed the lack of a quotient helped them. Many students treated 13^4 as $4 \times 13 = 52$ and others squared the 13 to give 169 as the base.
If full marks were not gained, many benefitted from a method mark for seeing 13^{-24}

11 This was the first time we had tested density on International Mathematics syllabus A and it was met with a pleasing response. We saw many completely correct responses and if not fully correct, students were generally able to benefit from a method mark for finding the volume of the sphere. Some had misconceptions about the formula for density, those using it incorrectly often used density = mass × volume and some used the surface area formula instead of the volume or squared the radius rather than cubing it.

12 On the whole this question was fairly well done, but a common misunderstanding was what was meant by an obtuse angle, many giving the answer as the reflex angle *DEF* and were only able to benefit from 3 marks out of 5. Clearly, knowing what is meant by reflex and obtuse is a very low grade, so students at this level do need to be made aware of the concepts. A pleasing number of students were able to pick up one mark for the angle sum of a hexagon and for some this was the only mark awarded. A significant number of candidates incorrectly thought that angle *EDC* was 144º because it was opposite angle *ABC*.

Incorrect solutions that in some cases led to correct answers included making incorrect assumptions, eg that *FDC* or *AED* were straight lines. By far the most common correct method, was to calculate the total for the angles in a hexagon, find angle *EDC* by interior angles and find the remaining angle for reflex *FED* and then finalise by subtracting *FED* from 360°.
Some very clever responses were seen involving a thorough understanding of angles on parallel lines which was very pleasing.

13 (a) This tree diagram question was very well done, with only a very few using replacement. The zero on the bottom branch caused a few issues for students who wondered what to do, but we allowed zero, zero over 9 or the branch left blank or crossed out.
(b) This part on finding the probability that Felix takes at least one blue card and no green card was well done, but it was not unusual for a student to miss blue, blue or to add the fractions instead of finding products.

14 This graph question was fairly well approached, with many students gaining full marks for the table of values and the plotting, although some did struggle with some points and drawing of the graph. Some students are still drawing curves as a series of straight lines. For those losing marks it was the negative values that created the most problems when completing the table. Most students plotted the graph well and when marks were lost it seemed to be mostly for the plotting of the final set of co-ordinates Students tended to struggle a bit more with part (c) as this was a more challenging part. A good number, however, were able to gain marks. Students must realise that when an equation just contains x, we are not looking for y as well so those giving coordinates lost the final accuracy mark. A number of students found the line to be $y = 2x - 3$ instead of $y = -2x+3$

15 A few students did not recognise this as an upper and lower bounds type question so merely used the numbers given for e – f, and some did this and then stated the lower bound for their answer. A common misunderstanding was to think that the lower bound for the sum would be found by taking the lower bound of 0.65 from the lower bound of 8.31. Even if students did this they were able to pick up a method mark for using the lower bound of 8.31. The accuracy mark here depended on seeing correct working, as requested, because the correct answer could come from incorrect working.

16 (a) This question was a little different to the usual question on proportionality, but it was met with a very high success rate. Students do need to be reminded to use an 'equals' sign for a formula rather than a 'proportional' sign; this was a common reason for students losing the accuracy mark.
(b) This question gained a mixed response, but on the whole, students were able to pick up one mark if not both. The best starting point was to use the R gained in (a) and equate it to $8/5x$ ie $2.5t^2 = 8/5x$ and for this M1 was awarded. Students found it harder to

accurately complete the sum because of the $5x$ on the denominator but there were a good number of correct answers. We also saw other convincing ways to show that t is inversely proportional to root x and these were able to gain full marks if carried through correctly.

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17 (a) Most students who knew about differentiation were comfortable answering this question and generally gained 2 marks. A number clearly did not understand what was involved.
(b) Several students were able to work out the values of x where the gradient was zero and were a bit puzzled how to finalise the answer, but a fair number were able to give a completely correct response. There were some accuracy issues with a surprising number equating the gradient to a random negative number. Some students had little idea on how to proceed with this part of the question and we saw a fair number of blank responses.

18 If candidates knew how to apply the cosine rule they made a good attempt at this question, but many showed they had no idea how to find which of the angles was the biggest. It was surprising that at this level students do not realise that the largest angle in a triangle is opposite the largest side. A correct use of the cosine rule to find any of the three angles was credited with M1. Some worked out the two smaller angles and subtracted the sum of these from 180° which was a perfectly acceptable method, although a bit long-winded. We saw a good number of fairly accurate diagrams where students had measured the angle, but the insistence on the angle to 1 decimal place usually meant no marks were awarded. It must be stressed to students that when a question says 'Work out...' a calculation is required. If we wanted an accurate diagram, we would have asked for one. On the other hand, if a student did not know how to start or how to find the largest angle, a fairly accurate diagram was sometimes seen to be useful.
There were a number of students who could correctly substitute into the Cosine Rule but then struggled to rearrange it correctly. There were also a significant number of responses where a Right Angled Triangle was assumed.

19 Students often find 3-D trigonometry and Pythagoras challenging and this question was no different. We did see a pleasing number of correct answers, but we saw a wide range of incorrect responses, where, in many cases, the student found the incorrect angle. Students who made an attempt but did not find the correct angle often gained a method mark for *BE* or *BD* found. . Several candidates started by using Pythagoras to find *BF* and then used this as the length *BD*. It was also unfortunate that many got the length correct but then at the end got the trigonometric ratio the wrong way round e.g. they used tan x=Adjacent/Opposite.
This question was another case where premature rounding could lose the accuracy mark.

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20 Clearly this histogram was a problem solving situation as students had to interpret the given histogram rather than draw one. Those students who realised the link between

frequency and area were often able to pick up a method mark for working out that 30 small squares were being used to represent 6 babies or that 5 small squares represented 1 baby; other less common ways of gaining this first mark were to show a correct frequency density on the vertical axis or showing the total number of squares needed to be divided by 5 to gain the frequency. Some students then continued with a fully correct method to find the number of babies with a weight between 2.5 kg and 4 kg to gain the 2nd method mark and in many cases, if they got this far, they also gained the accuracy mark. A number of students, having worked accurately lost the accuracy mark by omitting the addition of the first 4 babies
Many students incorrectly read the question and as a starting point assumed that there were 6 babies both below and above the weights given; this gained them 0 marks.

21 (a) Showing working clearly for this surd question was not something everyone could do. Some showed $\sqrt{45} = 3\sqrt{5}$ and $\sqrt{20} = 2\sqrt{5}$ as their calculator would without showing us the intermediate step of $\sqrt{45} = \sqrt{9 \times 5}$ and $\sqrt{20} = \sqrt{4 \times 5}$, gaining no marks. Students must remember that just writing down what their calculator gives is unlikely to gain marks in a 'show that' type question.
(b) Again, working needed to be shown here and clearly showing multiplying numerator and denominator by $\sqrt{3}+1$ was sufficient for the award of the method mark. The correct answer was easily possible from the calculator, so it was surprising how many gave an incorrect answer.
Many students knew they needed to rationalise the denominator but did so incorrectly using a multiplier $\sqrt{3}$ or $\sqrt{3}$-1.
(c) We awarded marks for a correct method here, but more often for the correct values of a and b which were seen a pleasing number of times, with the value of a being correct a lot more frequently than the value of b. Several candidates included an x with their $3\sqrt{2}$ and lost credit.

22 This question was set at grade 9 and on the intersecting chord theorem and was very demanding for many students. A common misconception for some students was to treat the centre of the circle as if it was a point on the circumference, giving radius = 16 cm which was incorrect. There were a good number of blank responses and then those that tried all sorts of different approaches such as trigonometry, Pythagoras or just adding lengths together. We did see some students correctly find the radius as 8 cm and then use the cosine rule to find x, which was perfectly acceptable.

23 We saw a fair number of blank responses on this high grade question, but some students had a go and were often able to pick up a method mark for putting the correct values for the sum of the first 48 terms, the first 36 terms or the first 30 terms of the sequence. Some were able to form a correct equation, although it was not uncommon to multiply the wrong amount by 4. Some students used strange methods to come up with actual

values for *a* and *d* which of course is not possible from the information provided in the question. It was pleasing to occasionally see a perfectly correct response.
This was a question where clear layout was essential. Those candidates that took care to present their work in a logical way were often successful whereas where working was muddled candidates often lost their way and also lost marks they might otherwise have gained.

Summary

Based on their performance in this paper, students should:

- Know the difference between obtuse and reflex angles
- Show clear working at all times
- Learn circle theorems with the correct wording not shortened versions and other angle reasons
- Use full answers, to interim calculations, rather than prematurely rounding
- Practise manipulating trig formula – both basic and cosine rule
- Work on shape/angle problem solving
- Work on simultaneous equations requiring the subtraction of a negative
- Develop their understanding of surds
- Don't complicate trigonometry questions when right-angled triangle trigonometry is all that is needed.
- Work on when to add and when to multiply probabilities

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